

THE NEOGENE CASSIDAE OF SOUTHERN FLORIDA, WITH
DESCRIPTION OF A NEW SPECIES OF *CASSIS*
(GASTROPODA: PROSOBRANCHIA)

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ABSTRACT

Species of the family Cassidae from the Neogene of southwestern Florida are discussed, and *Cassis ketteri* n. sp., from the Buckingham Formation, Lower Pliocene at Apac Fla., Inc., quarry (formerly Newburn Mine), Sarasota, Sarasota County, Florida, is described.

INTRODUCTION

Strata bearing fossil Mollusca in the Florida Neogene have produced very few genera of the family Cassidae. Of the three genera known to exist, only *Sconsia* is common. Of the remaining genera, *Cassis* and *Phalium*, the latter is probably the most rare. In the early Pliocene strata exposed in the quarry of Apac Fla., Inc., *Sconsia hodgii* (Conrad, 1841) appears in great numbers of beautifully-preserved specimens, making the acquisition of complete growth-series possible. *Phalium (Tylocassis) inflatum waltonensis* (Mansfield, 1935) has been very rarely found at the Apac Fla., Inc., pit. In addition, *Phalium (Tylocassis) granulatum* (Born, 1778) appears in the later Bermont Formation of Belle Glade, Florida. *Phalium alligator* Petuch, 1991, was described from dredge spoil from the Caloosahatchee Formation along the Miami Canal, Palm Beach County, Florida.

Of the genus *Cassis*, fossil specimens are few and far between. After 15 years of collecting in various southwestern Florida pits only 14 examples were available for a comparative study. One species, *Cassis floridensis* Tucker and Wilson, 1932 (Fig. 1, 3, 5, 7, 9, 11), is found in sufficient numbers of specimens to reconstruct a growth pattern. It resembles *Cassis madagascariensis spinella* Clench, 1944, which is rare in Florida but known from North Carolina to Yucatan, Mexico, the Greater Antilles, and Bermuda (Vokes and Vokes, 1983; Abbott, 1974:fig. 1743). Both nominal species have closely-spaced, small, even shoulder nodes and an overall reticulated sculpture, and are conspecific.

Another species, *Cassis delta* Parker, 1948, from the Miocene Chipola Formation of Calhoun County, Florida, has a bizarre appearance. It was compared by its author to *Cassis sulcifera* Sowerby (1850:plate 10, fig. 1) from the Cercado and Gurabo formations of the Dominican Republic (Vokes, 1990). Abbott (1968: 51) suggested that *C. delta* may be a synonym of *C. sulcifera* Sowerby, and is evidently related to *C. tuberosa* (Linnaeus, 1758).

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The genus *Cassis* may have been more prevalent in the Neogene pits of the Sarasota area than we realize, since the larger the shell, the more damage seems to occur due to mining. Large drag-lines bite through a given stratum, raise the load high in the air, then dump the contents onto spoil piles. Smaller shells often come through intact, whereas large specimens are either cut into pieces by the blade of the bucket, or are fragmented by the fall. Juvenile and sub-adult specimens of *Cassis floridensis* are more often retrieved than adults that have reached full size. The largest and most intact specimens have been collected in situ in the matrix of the stratum, without having gone through the drag-line experience.

Another possible reason for the dearth of large fossil specimens of *Cassis* is that the species are known to live, in the Recent, in relatively deep water of 10–20 feet. In Neogene seas, peninsular Florida must have periodically had shallow water on the fringe of the ocean as the water rose and receded. Perhaps not many of the then-existing helmet shells wandered in close to the shore.

Ancestors of the Recent *Cassis* in the area were of greater size and weight in full adult stage, with greater development of the upper-left border of the parietal shield. The sculpture of the upper whorls, from shoulder up, was stronger and more characteristic than in Recent species. In *C. delta*, for example, juveniles show strongly-developed radial, undulate costulae between the sutures and the corded margin of the whorls, a feature which persists even in gerontic specimens.

On 8 August 1987, Thomas F. Ketter of Bradenton, Florida, collected a large and almost intact specimen of *Cassis*, in situ, representing a new species. The specimen was taken from a sheer wall through the Buckingham Formation exposed at the Apac Fla., Inc., mine, Honore Road, Sarasota, Florida, at the extreme north end of the pit. This stratum corresponds to beds 7a and 7b of Petuch's stratigraphy (1982) of the Buckingham Formation (Petuch, 1986, 1987), the Pinecrest Beds of Olsson and Petit (1964), and the Middle Fruitville Formation of Waldrop and Wilson (1990). This level of the mine is amazingly fossiliferous and the spoil has produced many examples of the following species: *Busycotypus bicoronatum* Tripp, 1988; *Cassis floridensis* Tucker and Wilson, 1932; *Chicoreus floridanus* Vokes, 1966; *Cymatium (Linatella) floridanum* Mansfield, 1930; *Hystrivasum locklini* (Olsson and Harbison, 1953); *Murexiella textilis* (Gabb, 1873); *Sconsia hodgii* (Conrad, 1841); *Siphocypraea trippeana* Parodiz, 1988.

SYSTEMATIC PALEONTOLOGY

Subclass Prosobranchia
Order Archaeogastropoda
Superfamily Tonnoidea
Family Cassidae

Cassis ketteri, new species (Fig. 2, 4, 6, 8, 10, 12)

Diagnosis.—The shell of this species of *Cassis* may be distinguished from congeners by the combination of dome-shaped spire, the parietal shield not projecting above the shoulder of the body-whorl and the anterior columella with a large raised protuberance.

Description.—Shell slender and elongated. The spire is dome-like and consists of ten rounded whorls; the protoconch is raised but incomplete, having been mutilated on one side by a predator. Spire whorls not decidedly conic, but distinctly convex. The sculpture of the spire, from the third whorl to the shoulder, consists of numerous axial-oblique costulae; in each whorl these costulae are divided into

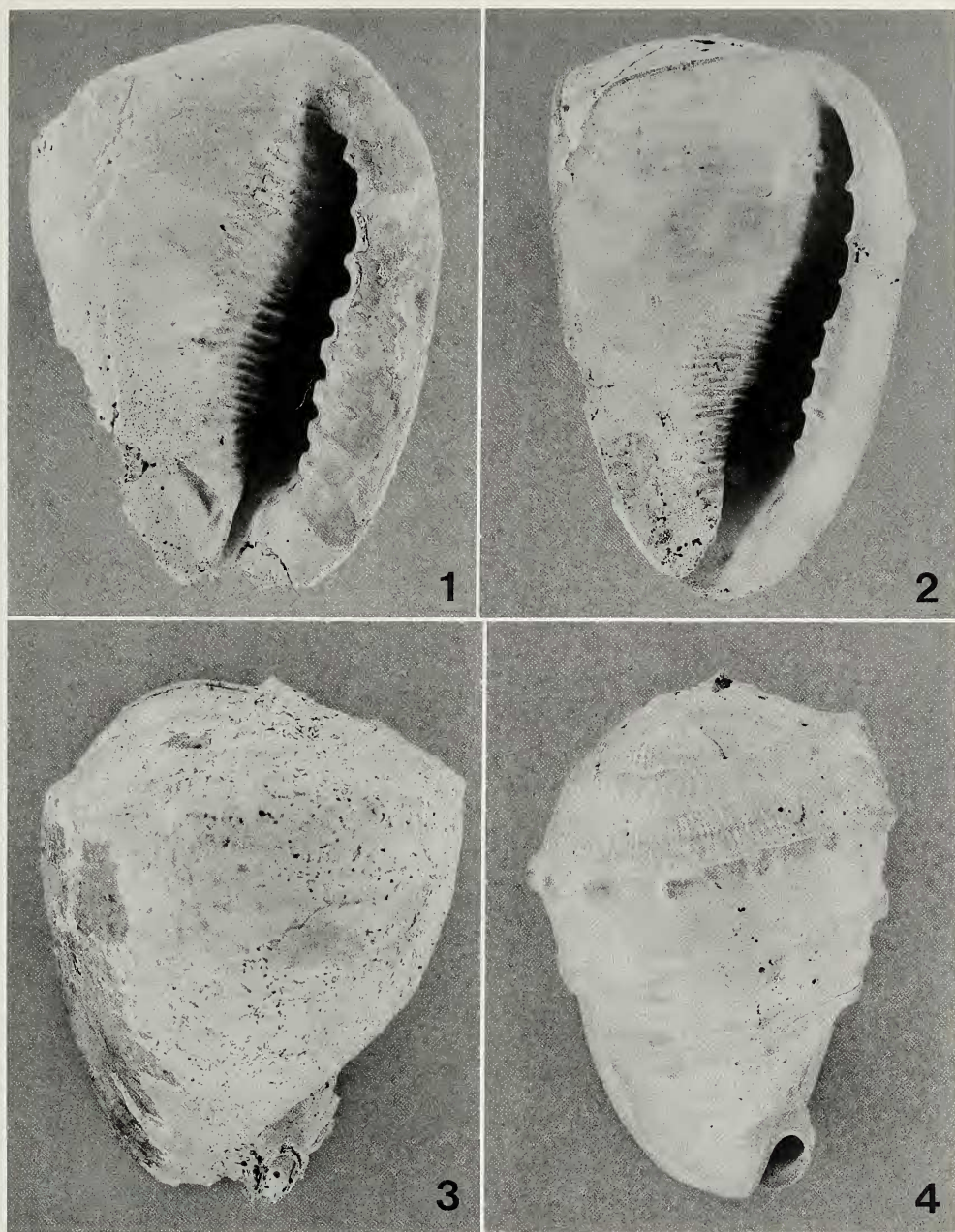


Fig. 1-4.—Ventral and dorsal aspect of *Cassis* species: 1. Ventral view, *C. floridensis*; 2. Ventral view, *C. ketteri*; 3. Dorsal view, *C. floridensis*; 4. Dorsal view, *C. ketteri*.

two sections at the middle and at the base making the suture crenulated and deep. Close to the shoulder the costulae are finer and irregularly spaced. Below the shoulder the sculpture is replaced by the regular lines of growth, which are more conspicuous at the base. The shoulder of the body whorl has a row of seven heavy, pointed knobs followed by several (possibly four) additional knobs which have coalesced into a bumpy, solid ridge, terminating at the outer lip. Below the line of shoulder knobs, there are three additional horizontal rows of heavy knobs located at the middle and lower sections of

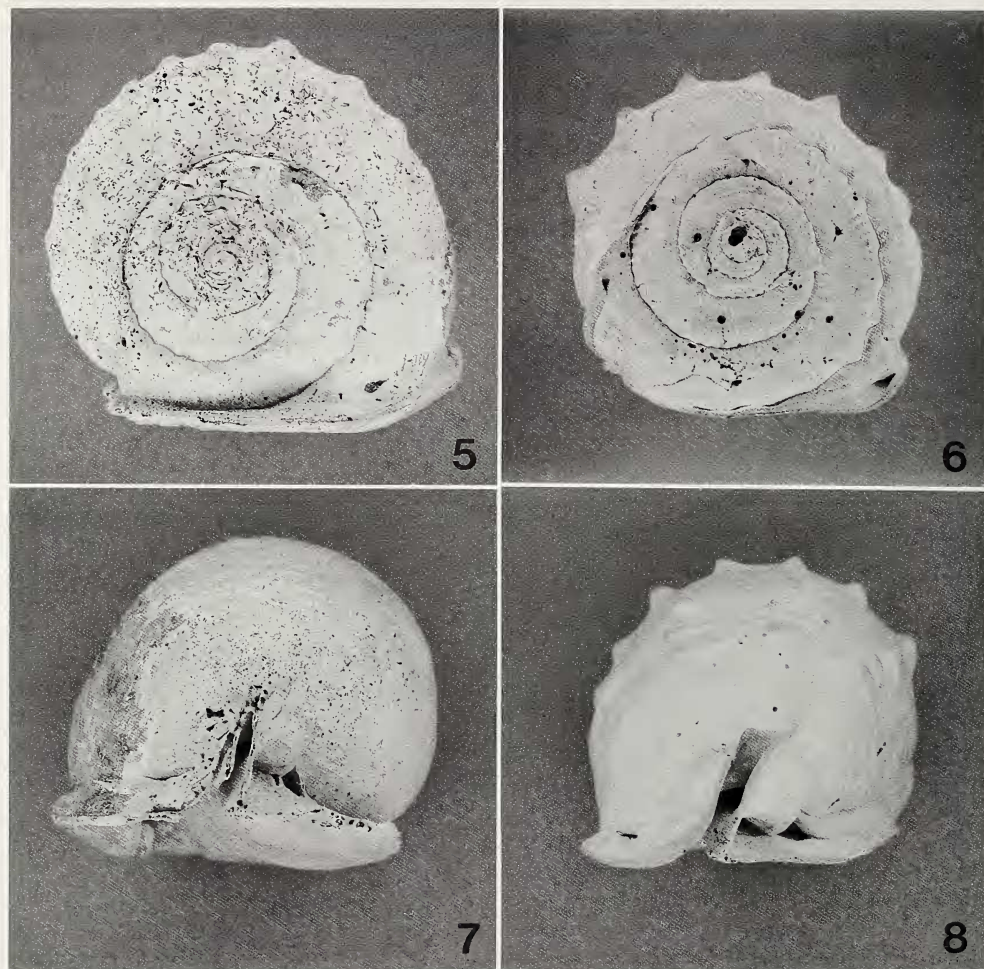
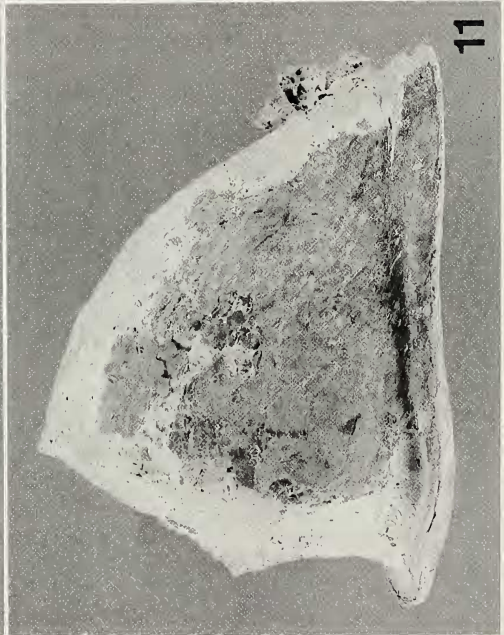
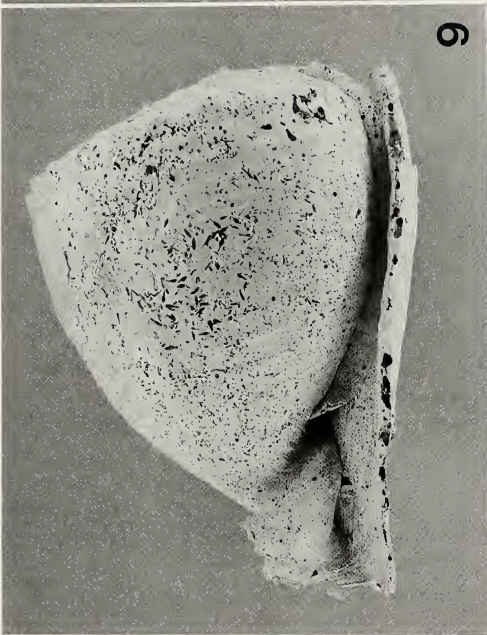
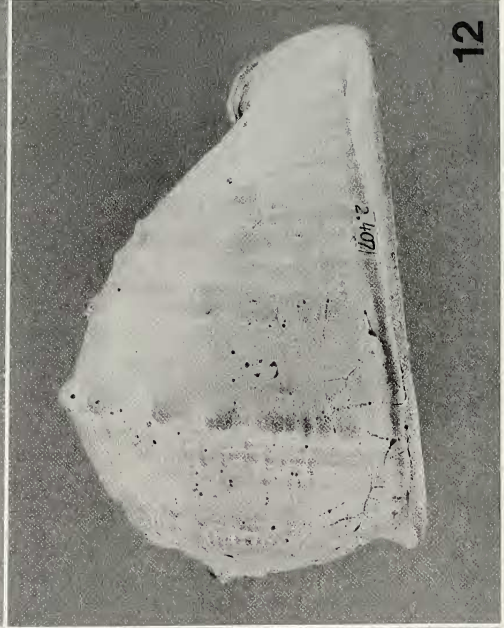
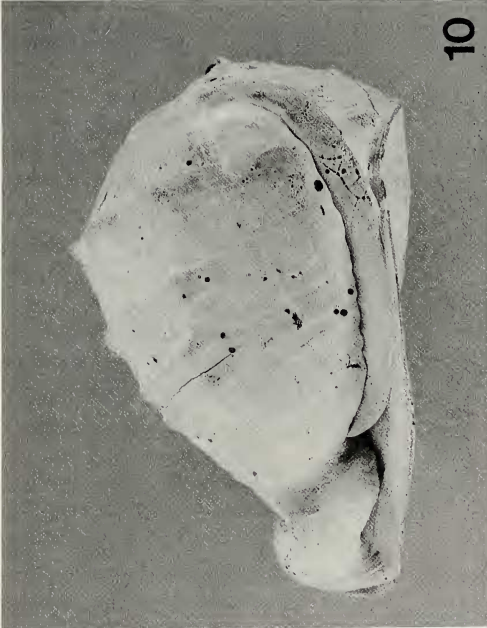


Fig. 5-8. —Posterior and anterior aspect of *Cassis* species: 5. Posterior view, *C. floridensis*; 6. Posterior view, *C. ketteri*; 7. Anterior view, *C. floridensis*; 8. Anterior view, *C. ketteri*.

the body whorl; each of these lines consists of only four knobs, closer vertically but well separated horizontally. Between these rows, and especially on the lower section, there are finer, but strong, spiral cords, forming regular sulcations in between. The columella is wrinkled with fine plications on the anterior half only and the posterior columella has a large raised protuberance of approximately three millimeters with a smaller rounded pimple beneath it. The outer lip has ten very narrow, sharp teeth, strongest at the middle; the margin of the lip is very little reflected. The intact edge of the oval-shaped parietal shield is narrow and elongated, extending only to the shoulder line, and retains a yellow stain; the yellow coloring remains between the plications of the anterior columella. The shield is slightly reflected at the shoulder border and on the columellar edge. The upper half of the shield is very thin, allowing the spiral cords of the body whorl to be seen. Eleven regularly-spaced rows of cords are present in this area. These rows also continue on the columellar side, inside the aperture. Inside the long and narrow aperture, the parietal wall is very white, shiny, and almost porcelaneous, as if it were

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Fig. 9-12. —Lateral aspect of *Cassis* species: 9. Left lateral view, *C. floridensis*; 10. Left lateral view, *C. ketteri*; 11. Right lateral view, *C. floridensis*; 12. Right lateral view, *C. ketteri*.



a fresh shell. There is a dorsal fold or sharp varice along the shell which, at the base, touches the lower reflection of the margin of the parietal shield and ends at the umbilicus. The folding of the columellar lip, at the base and around the siphonal canal, forms a false umbilicus.

Dimensions of the holotype are: length 141 mm; width 81 mm at the body-whorl suture; width 85 mm at the shoulder; width 43 mm at the anterior end, including end of siphonal canal; length of outer lip, 125 mm; length of aperture, 110 mm; width of aperture at entrance of siphonal canal, 7 mm; width of aperture at widest point, 18 mm; width of columellar callus at midpoint, 119 mm; height of spire (apex to shoulder), 31 mm, approximately one-fifth total length of shell.

Type locality.—Apac Fla., Inc., Mine, Honore Road, Sarasota, Sarasota County, Florida; Buckingham Formation, Lower Pliocene.

Holotype.—Section of Invertebrate Zoology, Carnegie Museum of Natural History, Catalog Number 47.209.

Etymology.—The new species is named for Mr. Thomas F. Ketter who discovered the holotype.

Referred material.—A second, larger specimen of *Cassis ketteri* from the Apac Fla., Inc., pit was collected by Mrs. Yvonne Bequet of St. Petersburg, Florida. In this specimen the shoulder knobs are sharply pointed, and those on the dorsum are quite produced and flange-like. However, it has the same dome-like spire, and spiral cords on the dorsum that can be seen through the thin shield; also the same upper-columellar pimple. The shield preserves a stronger coloration than in the holotype, and the aperture is wider. This specimen has only three rows of dorsal knobs. It measures 166 mm in length by 123 mm wide, and has ten outer lip teeth. The specimen remains in Mrs. Bequet's collection and is not included in the type series.

Another specimen of *C. ketteri* was collected at Warren Bros. pit (Apac Florida Corporation) by Mary V. Palmer in 1974 and is now in the private collection of J. J. Tripp. It is similar to the holotype of *C. ketteri* but slightly smaller. It has the same number of outer lip teeth and dorsal knobs as the holotype, and the same columellar folds. The parietal shield is thinner than in the holotype of *C. ketteri*, orange in color, and very shiny. The spiral lines at the dorsum are as well developed as in the holotype of *C. ketteri*.

Comparisons.—The new species, *Cassis ketteri*, is closer to *Cassis floridensis* Tucker and Wilson, 1932 (Fig. 1, 3, 5, 7, 9, 11), than to any other species. Comparing specimens of approximately the same size and stage of development, *C. floridensis* has 11 broad, square teeth on the outer lip, and *C. ketteri* has only ten narrow, very sharp teeth, which are arranged horizontally on the narrow outer lip. The outer lip of *C. floridensis* is wider, and the blunt teeth slope anteriorly at a definite angle. The early whorls of the spire in *C. floridensis* are flattish, not dome-like as in *C. ketteri*. The axial sculpture of the two species is similar, although the sutural line is not crenulated in *C. floridensis*. The authors of *C. floridensis* described the columella as "strongly plicate for its entire length"; in *C. ketteri* the columella is wrinkled with fine plications only on its anterior half. *Cassis floridensis* lacks the large raised protuberance on the anterior columella and the smaller pimple below it found in *C. ketteri*.

Again quoting Tucker and Wilson's (1932) description of *C. floridensis*, "the outer lip has ten plications." In a series of 13 examples of *C. floridensis* (from a juvenile 32 mm long to a 228-mm large adult) from the Apac Fla., Inc., pit, two have 11 wide, heavy teeth on the outer lip, and the largest specimen has only nine. Therefore, the number of teeth is variable within the species. The full-grown parietal shield of *C. floridensis* is thick and projects well above the body-whorl, beyond the shoulder, while in *C. ketteri* the intact edge of the shield only reaches the shoulder line. In general shape *C. floridensis* is shorter and broader than *C. ketteri* and has a shorter, flatter spire. The umbilical area is similar in both species.

The holotype of *C. floridensis* (Tucker and Wilson, 1932:plate 2, fig. 2 and 5; plate 5, fig. 2) is a young shell, with the spire quite elevated and not convex, and the dorsum crossed by about 14 regular spiral cords which, intersecting with the

axial costulae of growth, produce a reticulated pattern. The spiral cords are well developed under the parietal shield in our series of sub-adult *C. floridensis*, as well as in the figured holotype. In adult specimens they almost disappear. In the adult holotype of *C. ketteri* these lines persist in a strong and regular manner.

The protoconch of *C. floridensis* was described as having "about three smooth whorls. Next whorl spirally sculptured." In our series of *C. floridensis* those with the nuclear whorls preserved show a smooth nucleus of one-and-one-half whorls, followed by a smooth first post-nuclear whorl, and radial sculpture beginning on the second post-nuclear whorl.

Differences between the older *Cassis delta* Parker, 1948, *C. ketteri*, and *C. floridensis* are more conspicuous. The spire in *C. delta* juveniles is higher and very acute, and the aperture wider and strongly plicate at the base of the columellar margin. The sculpture of whorls above the shoulder, even in adults, has peculiar flammular radial costulations which are stronger than those found in *C. ketteri*, which begin immediately after the nucleus. The parietal shield in *C. delta* is "so alate as to form an equilateral triangle" (Parker, 1948), which makes the aperture appear comparatively smaller in adults. The length of the holotype of *C. delta* is approximately the same as that of the holotype of *C. ketteri*, but the width is much greater, reaching 140 mm at the shoulder. This is more than 70 percent wider than *C. ketteri*.

Cassis ketteri belongs to the same species-group as, and is probably ancestral to *Cassis tuberosa* (Linnaeus, 1758), a Recent species which occurs from North Carolina to Brazil. It is possible that some specimens from Brazil identified as *C. tuberosa* are actually *C. madagascariensis*. Neither *C. tuberosa* nor *C. ketteri* have a reticulated surface, but both have rounded and gently convex early whorls and prominent shoulder knobs. These knobs are more closely spaced in *C. tuberosa*, followed by the three spiral lines of knobs just above the shoulder that are absent in *C. ketteri*. The shield is also different in the two species: *C. tuberosa* has a roughly triangular shield, but not as triangular as that of *C. delta*, while *C. ketteri* has an oval, narrowly elongated shield which conforms to the general shape of the shell.

Cassis madagascariensis spinella is more similar to *C. floridensis* than to *C. ketteri*. Since *C. m. spinella* is found at several localities within the range of *C. madagascariensis madagascariensis*, it is not a "geographical race" as originally described, nor is it a subspecies. If the differences between *C. madagascariensis* and *C. spinella* are confirmed as constant and distinguishable, then it must be a separate species.

DISCUSSION

A large fossil *Cassis* specimen was borrowed from the collection of Adam Nosal, retired miner-in-charge of fossilers at the Apac Fla., Inc., quarry, where the specimen was collected and is displayed. It is different from the new species. This specimen is badly damaged on the lower dorsum, and additionally near the outer lip, and is filled with shell rubble and matrix. There is also minor damage just above the shoulder and severe loss on the reflected canal. The nucleus is missing. The outline of this specimen is very broad at the shoulder and reduces quite rapidly to the pinched anterior canal. There are ten, plus the suggestion of an eleventh, heavy, blunt knobs on the shoulder. Two flange-like knobs at mid-dorsum are most pronounced; the largest measures 19 mm high. Two additional rows of lesser-sized knobs follow the shoulder line dorsally. There are nine or ten

heavy cord-like ridges spaced over the dorsum and these cross the third line of knobs. The spire consists of four gently-rounded whorls, up to the missing nucleus. Minute vertical lines cover these whorls. The triangular columellar shield extends to just above the shoulder. Approximately 24 thin, wrinkle-like plications cover a little over half of the anterior columella. Pale orange coloring partially remains on the callus. Ten blunt teeth are spaced on the outer lip.

The height of this specimen is 182 mm; height of shield, 150 mm; width of shoulder including knobs, 129 mm; width of shield at shoulder, 80 mm.

This *Cassis* specimen, although similar in some ways to *C. ketteri*, is distinct from it in having only three rows of dorsal knobs, compared with four rows in *C. ketteri*. The shield is much wider on this specimen and the body whorl is much more bulbous. The holotype of *C. ketteri* has all the shoulder knobs of approximately uniform size, whereas the other specimen has two greatly enlarged dorsal shoulder knobs which are reminiscent of the Recent Pacific *Cassis cornuta* Linnaeus (1758). It is apparent that this specimen is similar to the specimen figured in Petuch (1988) as *Cassis floridensis* Tucker and Wilson, 1932. Both specimens belong, apparently, to the same undescribed species which is different from *C. ketteri*.

Cassis ketteri, *C. delta*, *C. floridensis*, and the undescribed species mentioned above possibly form an intermediary group between *Cassis* and *Cypraecassis*, but it would be premature at this time to define or to name a formal taxon at the generic or subgeneric level.

As for the antiquity of the genus *Cassis*, it might not have developed before the late lower- or mid-Tertiary. According to Abbott (1968), the family Cassidae originated in the Eocene and by the Miocene it had a worldwide distribution in warm temperate waters.

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